REMARKS

This Preliminary Amendment and the Request for Continued Examination submitted herewith follows a Notice of Appeal filed by Applicant on May 23, 2006. At the time of the filing of the Notice of Appeal, claims 33-53 were rejected. By this amendment, claims 33-53 have been cancelled and new claims 54-74 have been added. Applicant respectfully requests allowance of the new claims 54-74 for the following reasons.

Prior claims 33-53 were rejected as being unpatentable over U.S. Patent No. 6,795,409 to Youssefmir, et al. ("Youssefmir"), and further in view of U.S. Patent No. 6,006,110 to Raleigh ("Raleigh") and further in view of U.S. Patent No. 6,377,636 to Paulraj, et al. ("Paulraj"). The remarks stated below have been prepared based on the combined teachings of Youssefmir, Raleigh and Paulraj as they might be applied to new claims 54-74.

The basic contention set forth in prior Office Actions is that channel estimation taught in the Youssefmir, Raleigh and Paulraj corresponds to the noise estimation recited in the prior claims. New claims 54-74 have been added primarily add structural and/or functional features that determine channel estimates for a communication channel. This is in contrast to the presently (as well as previously) claimed noise estimation for the signal received in the communication channel.

Applicant respectfully submits that new claims 54-74 are patentable over the combination of Youssefmir, Raleigh and Paulraj, whether such references are taken individually or in any combination thereof. Plainly stated, the prior art cited in the preceding Office Actions fail to recite the claimed combination of features in the new claims 54-74. For instance, the prior Office Action dated March 20, 2006 contends that, "Youssefmir et al. discloses a system that may uses pilot tones sent with each data packet in order to determine weighting factors (for noise mitigation) for the base station (Col 27 lines 43-55)." Office action dated March 20, 2006, at page 2. Firstly, the mention in Youssefmir, et al. that pilot tones can be utilized, does not arise to any teaching or suggestion that noise estimation is performed on the pilot tones being mentioned. This is supported by the admission at the top of page 3 of the Office Action dated March 20, 2006. This admission further supports the failure of Youssefmir to teach beamforming, as recited in claim 54, which is computed based on a channel estimate and based on the noise

estimate of at least one of the plurality of the first type of tones that is nearest the at least one tone of the plurality of the second type of tones in the received signal.

The prior Office Action (See Office Action dated March 20, 2003) relies on Raleigh for a purported teaching of a noise estimator. The March 20th Office Action states that, "the system [of Raleigh] further comprises a noise estimator (Col. 8, lines 35 – 45) to estimate the noise (SNR) of the received signals (Col. 8, lines 10- 25)." Office Action dated March 20, 2003, at page 3. In contrast to the contention in the Office Action, the various embodiments disclosed in Raleigh at column 8, lines 25-45 as well as Raleigh more generally fail to teach or suggest the particular channel estimation, noise estimation and beamforming recited in new claim 54. The Office Action relies on generalities such as at column 8, lines 10-15, to recite a noise estimator, but fails to identify any disclosure in Raleigh or other reference that teaches the particular type of noise estimation recited in claim 54. Instead, as described in the Supplement 1 section of Raleigh, Raleigh discloses that the noise estimate is computed for each data subcarrier; namely, based on the received signal, the channel estimate and an estimate of the transmitted data at each data subcarrier. See Raleigh at Col. 15, line 61, through Col. 17, line 28. This is in sharp contrast to the noise estimation recited in claim 54, which is performed on each of the plurality of the first type of tones.

As a consequence of failing to teach the noise estimation of the type recited in claim 54, the combination of Raleigh and Youssefmir further fails to teach or suggest the particular beamforming recited in claim 54; namely, beamforming computed based on the channel estimation and based on the noise estimation of at least one of the plurality of first type of tones that is nearest the at least one of the plurality of second type of tones in the received signal. This is because that Raleigh teaches that the noise estimates, which are utilized in beamforming, are computed at each data subcarrier in contrast to as is being recited in claim 54. See Raleigh at Col. 15, line 61, through Col. 17, line 28. In claim 56, the first type of tones are recited as being training tones and the second type of tones are recited as being data tones, which further manifests how the approach taught by Raleigh is significantly different from what is being claimed. Therefore, even if one implemented Raleigh's noise reducing method to improve communication in the system of Youssefmir, et al., the combination would still fail to teach the noise estimation and beamforming recited in claim 54.

The Office Action also relies on Paulraj for purported teaching of a beamforming. However, Paulraj fails to make up for the above-described deficiencies of both Raleigh and Youssefmir. Specifically, at column 10, lines 4-13, Paulraj teaches that beamforming is performed on channel estimates that may be based on training sequences. However, Paulraj fails to teach that any beamforming is performed based on both channel estimates and noise estimates for each of the plurality of first type of tones, as recited in claim 54. The fact that the system (as taught by Paulraj) can transmit both data tones and training tones together, as suggested in the Office Action, does not provide sufficient teaching or suggestion or motivation to perform noise estimates on training tones as the Office Action contends. This contention appears to follow a faulty line reasoning that channel estimation that is used to provide an estimate of channel is essentially the same as or includes noise estimate of a received signal.

Since claim 54 recites that beamforming is computed based on both a channel estimate and noise estimate, for the reasons stated above, the combination of Youssefmir, et al., Raleigh and Paulraj does not render claim 54 obvious. Applicant submits that the prior Office Actions appear to blur a clear distinction, which is known to persons of ordinary skill in the art, between channel estimation and noise estimation to arrive at the conclusion that the prior claims 33-53 were obvious. For example, the Office Action dated May 25, 2006, contends that application of channel estimates to all data tones on a particular channel is the same function as was previously being claimed.

Applicant respectfully points the Examiner to the current claims 54-74 and to the requirement that all limitations must be considered in ascertaining patentability. Similarly, the teachings of the cited references must be evaluated as a whole and not by taking selected portions out of context. The Examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed. *In re Rouffet*, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998). The reliance on the prior art teachings of channel estimation do not amount to a corresponding teaching of noise estimation as recited in claim 54. For example, how does the Examiner suggest the noise estimate would be provided from a channel estimate since the channel estimate characterizes the entire communication channel? This point about the inadequate of the prior rejections is further manifested when

considered in view of the teachings of Raleigh, as discussed above, in which the noise estimate is determined based on the received signal, the channel estimate and an estimate of the transmitted data at each subcarrier. See Raleigh at Col. 15, line 61, through Col. 17, line 28.

The Office Action dated May 25, 2006, specifically states: "as written, the claim may be read as any number of training tones may be used to provide part of the noise estimation for any number of data tones." Office Action dated May 25, 2006, at page 4. However, this type of paraphrasing seems to purposely neglect part of the claimed subject matter contrary to what is required. Claim 54 (similar to prior claims) recites that "the beamforming is computed based on the noise estimate of at least one of the plurality of the first type of tones that is nearest the at least one of the plurality of the second type of tones in the received signal." Therefore, the subject matter omitted in the Office Action's characterization of what is being claimed enabled the Office Action to reach an improper conclusion of unpatentability. Applicant submits that the failure to consider all terms in a claim determining patentability has resulted in improper rejection of claimed subject matter.

Additionally, in characterizing prior remarks in applicant's response, the Office Action states "that applicant argues (remarks page 9) that the claimed invention facilitates beamforming for each individual tone based upon it's own noise estimate rather than an entire channel estimate, but that is **not** true." Office Action dated May 25, 2006, at page 4. In contrast to the suggestion in the Office Action of May 25th, each individual tone does have its own noise estimate. Consistent with what is being claimed, a given training tone noise estimate can be applied to more than one data tone if each such data tone is nearest the same training tone, for example. This concept, as recited in claim 54, is contrast to the combined teachings of the cited references.

For the reasons stated above, allowance of new claim 54 and claims 55-59, which depend from claim 54, is respectfully requested.

Claim 55 depends from claim 54 and further recites additional subject matter of the estimating noise. From claim 54, the channel estimate and noise estimate are different elements. Similar to as discussed in a prior response, claim 55 recites two independent indications that are computed: namely; (1) a first indication of a difference between a first one of a first type of tones in one burst relative to the first one of the first type of tones in a proceeding burst; and (2) a

second indication of variance and correlation of the first indication. The particular teachings of Raleigh at column 11, lines 40-56, fails to teach or suggest the particular first and second indications that are computed according to the method of claim 55. Moreover, claim 55 averages the second indication over time to provide an average indication of noise that defines the noise estimate for at least one of the plurality of the first type of tones (See claim 54). Allowance of claim 54 is respectfully requested.

Additionally, claim 57 relates to indexing and selection of the plurality of the first types of tones and the plurality of second types of tones. As recited in claim 57, at least one of the plurality of first type of indexed tones indexed is selected that is nearest a given indexed second type of tone in the received signal. Based upon the indexing and selection recited in claim 57, beamforming is computed for the given index second type of tone based at least in part on corresponding noise estimates of the selected first type of indexed tone that is nearest the given indexed second type of tone in the received signal. In contrast to the contention of prior Office Actions, Paulraj fails to teach or suggest a particular indexing and selection of tones as recited in claim 57 such that the corresponding beamforming recited in claim 57 can be computed. Therefore, claim 57 is also patentable over Youssefmir, et al., Raleigh and Paulraj, taken individually or in any combination thereof.

New claim 59 recites a method in which the channel estimation comprises extracting the plurality of the first type of tones for the received signal the channel estimation being performed based on the plurality of the first type of tones extracted from the received signal and wherein the estimating noise is performed for each of the plurality of the first types of tones extracted from the received signal. The Office Action of October 18, 2005, contends that the system of Youssefmir inherently comprises a training tone extractor. However, it is well settled that an element of a claim is not inherent in disclosure of prior art unless extrinsic evidence clearly shows that missing descriptive matter is necessarily present in the thing described in the reference. *In re Robertson*, 49 USPQ2d 1949 (Fed. Cir. 1999). There simply is nothing disclosed in Youssefmir that would provide for the interrelationship of the extracting of the first type of tones and the channel estimation and the noise estimation, as recited in claim 59. Accordingly, allowance of claim 59 is respectfully requested.

Claims 60-64 relate to a communication receiver written in means plus function format and are allowable for at least the reasons stated above with respect to claim 54, 55, 56, 57 and 58, respectively.

Claim 65 recites a communication receiver that includes a tone extractor, a channel estimation, a noise estimator and a beamformer. Claim 65 is patentable over the combination of Youssefmir, et al., Raleigh and Paulraj for at least the same reasons discussed above with respect to claims 54 and 59.

Claim 66 is patentable for at least the same that claim 55 is patentable.

Claim 67 is at least the same reasons that claim 56 is patentable.

Claim 68 is patentable for at least the same reasons that claim 57 is patentable.

Claim 69 is patentable for at least the same reasons that claim 58 is patentable.

Claim 70 further recites that the receiver of claim 55 is implemented as part of an application specific integrated circuit. Applicant submits that the art of record fails to teach the combination in which the receiver of claim 65, as discussed supra., is implemented as part of an application specific integrated circuit. Allowance of claim 70 is respectfully requested.

Claim 71 recites that the communication receiver of claim 65 is implemented as executable instructions programmed in a digital signal processor (DSP). Applicant respectfully submits that implementing such a receiver in a DSP is not shown or taught in the art of record such that claim 71 is patentable.

Claim 73 recites a wireless communication system comprising at least one antenna, a preprocessing system, a channel estimator, a noise estimator and a beamformer, as specifically recited therein. Applicant respectfully submits that such a wireless communication is not taught or suggested in the art of record including Youssefmir, et al., Raleigh, and Paulraj for at least the reasons stated above with respect to new claim 54. For these reasons claim 73 and 74 depending therefrom are allowable and their allowance is respectfully requested.

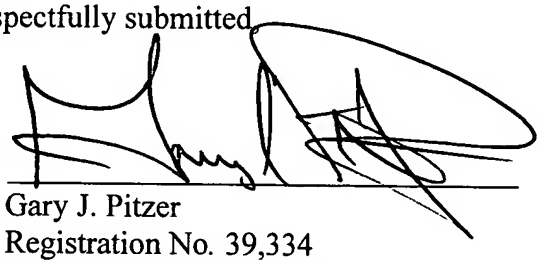
CONCLUSION

In view of the foregoing remarks, Applicant respectfully submits that the present application is in condition for allowance. Applicant respectfully requests that the application be passed to issue, including claims 54-74.

Should the Examiner have any questions concerning this paper, the Examiner is invited and encouraged to contact Applicant's undersigned attorney at (216) 621-2234, Ext. 106.

No additional fees should be due for this response. In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to Deposit Account No. 20-0668.

Respectfully submitted,

By: 

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